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Interindustry Wage Differentials: Evidence, Explanations and Potential Distortions

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ABSTRACT

This paper reviews the empirical literature on interindustry wage differentials and examines potential microeconomic explanations for non-competitive wage differentials and their implications for distortions in the labour market. The empirical review suggests that there exist large and persistent interindustry wage differentials in Canada and the U.S., after controlling for differences in workers' human capital and demographic characteristics and differences in job characteristics across industries. This implies that workers in some industries tend to earn wages in excess of opportunity costs (i.e. rents). Rationales for these wage differentials are found in theories of efficiency wages and worker bargaining power. Both sets of theories suggest that interindustry wage differentials create market failures by distorting the marginal productivity of labour across industries. Efficiency wage theories suggest that there may be too few jobs in high-wage industries, while some bargaining models suggest the contrary but not very likely result that employment in high-wage industries is inefficiently high.

RÉSUMÉ

Cet étude passe en revue les ouvrages empiriques portant sur les différences de salaire interindustrielles et examine les explications micro-économiques possibles de ces différences de salaire non concurrentielles et les distorsions qu'elles introduisent dans le marché du travail. Les ouvrages empiriques laissent croire qu'il existe des différences de salaire interindustrielles importantes et persistantes au Canada et aux États-Unis, même en tenant compte des différences entre les caractéristiques démographiques et le capital humain des travailleurs et des différences entre les caractéristiques des emplois d'une industrie à l'autre. Cela laisse croire que les travailleurs de certaines industries gagnent dans l'ensemble plus que leur coûts d'opportunité (c. à-d. rentes). On trouve des explications rationnelles de ces différences de salaire autant dans les théories de salaires d'efficience que dans les modèles fondés sur le pouvoir de négociation des travailleurs. Selon les deux ensembles de théories, les différences de salaire interindustrielles engendrent des disfonctionnements du marché en créant des distorsions de la productivité marginale du travail d'une industrie à l'autre. Les théories de salaires d'efficience donnent à penser qu'il y a peut-être trop peu d'emplois dans les industries à salaire élevé, tandis que certains modèles fondés sur la négociation donnent à penser que le nombre d'emplois dans ces industries soit trop élevé, la dernière conclusion étant moins probable que la première.

CONTENTS

1.	Introduction	1
2.	Evidence on Interindustry Wage Differentials	2
2.1	U.S. Evidence	3
2.2	Canadian Evidence	7
2.3	Interindustry Wage Differentials as Unmeasured Differences in Labour Quality	18
2.4	Empirical Regularities in the Interindustry Wage Structure	21
3.	Efficiency Wage Rationales for Interindustry Wage Differences	21
3.1	Selection Models of Efficiency Wages	24
3.2	Incentive Models of Efficiency Wages	25
3.2.1	Alternative Devices for Ensuring Labour Quality - the Bonding Critique	26
3.3	Fairness Models of Efficiency Wages	27
3.4	Labour Market Distortions Arising from Efficiency Wages	27
4.	Worker Bargaining Power as a Rationale for Wage Differences	30
4.1	The Monopoly Union Model	30
4.2	The Efficient Bargains Model	32
4.2.1	Do Efficient Bargains Necessarily Imply Over-employment in the Primary Sector?	35
4.2.2	Criticisms of Efficient Bargains and Implications for Allocative Distortions	37
4.3	Insider-Outsider Theories of Workers' Market Power	37
5.	Conclusion	39
	References	41

1. INTRODUCTION

One of the most active areas of research on labour markets in the last decade has centred on whether or not workers with identical abilities, skills and preferences obtain different job rewards in different industries. It may be that while some workers find jobs in high-wage industries, where wages exceed their opportunity costs (the excess is known as rents or wage premiums), other observably identical workers have little choice but to accept jobs in low-wage industries.[1] If this is indeed the case, it would suggest that there are important distortions in the operation of labour markets.

The purpose of this paper is twofold: (1) to review the empirical evidence on interindustry wage differentials in Canada and the U.S. with the objective of determining whether or not these differentials reflect the presence of labour market rents, and (2) to determine the structural consequences of non-competitive wage differentials by examining the various theories explaining these job rents and their implications for distortions in the labour market.

The importance of establishing the existence of non-competitive wage differentials lies in the potential for distorting employment and production decisions, thereby impeding economic efficiency. The idea is that an interindustry wage differential may distort the marginal productivity of labour across industries, since firms make their employment decisions by setting the value of their marginal product of labour (VMPL) to their wage. As a result, firms in high-wage industries may have a higher VMPL than those in low-wage industries. This would mean that labour is allocated inefficiently across industries, since total output could be increased by shifting workers from low-wage, low-productivity sectors to high-wage, high-productivity sectors. Such wage differentials may also have implications for economic performance during business cycles, but these are examined elsewhere (eg. Stiglitz 1987: 33-39).

The empirical evidence based on microdata is reviewed in section 2. It shows that there exist large and persistent interindustry wage differentials after controlling for workers' human capital and demographic characteristics. This is shown in the first instance for the U.S., which has been the object of most of the empirical research, and then for Canada. After controlling for worker characteristics, wages in Canada (1986) range from about 26% above average (i.e. for all industries) in mineral fuels to 20% below average in accommodation and food services. These wage differentials tend to persist even after controlling for differences in nonwage compensation, skill mix and union power across industries. Yet, the possibility remains that the estimated wage differentials reflect unmeasured differences in labour quality across industries rather than true labour market rents. Section 2.3 reviews several statistical methods for assessing this hypothesis and concludes that it cannot account for the size of the estimated interindustry wage differentials.

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[1] The terms "high-" and "low-" wage industries are used to contrast industries that pay job rents (i.e. wages in excess of reservation levels) with those that do not. In other words, we refer here not to observed interindustry wage differentials, but to estimated wage differentials which control for differences in workers' human capital characteristics and for differences in nonwage compensation and non-pecuniary job characteristics across industries. Yet, as shown below, industries that provide job rents also tend to pay higher wages in practice.

From a firm's perspective, paying rents implies paying more than what is required to get qualified workers to accept a job. In determining the consequences of non-competitive wage differentials, the early trade literature assumed that firms' employment decisions are based on equating the VMPL to the wage, as mentioned above (eg. Bhagwati and Srinavasan 1983, ch. 21). The implication is that the sector which pays job rents (known as the primary sector) employs a suboptimal number of workers, because firms stop hiring workers at a point where their VMPL strictly exceeds that in the secondary sector, where firms pay no rents. In this framework, interindustry wage differentials are always distortionary, because they generate differences in the VMPL across industries. However, when the analysis of distortions is derived directly from the theories of non-competitive wage differentials, the "wage-equals-VMPL" condition may no longer hold, thereby implying distortions different from those above. Herein lies the motivation for examining the potential explanations for such labour market rents and the distortions in employment and production decisions resulting therefrom.

Section 3 examines efficiency wage rationales for interindustry wage differentials, whereby wages affect labour productivity either through their effect on the performance of individual workers - the incentive effect; or through their effect on the distribution of workers hired - the (adverse) selection effect. This set of theories implies distortions in the form of underemployment in the primary sector (i.e. the efficiency wage sector). Firms are assumed to have all the market power in employment relationships. Hence, the firm sets the optimal wage premium - at the point where the increase in labour productivity is equal to the premium - and then hires workers until their VMPL is equal to the efficiency wage. The resulting distortion is qualitatively similar to that in the early trade literature, because primary sector firms always have a higher VMPL than secondary sector firms.

Section 4 considers rent-sharing explanations of non-competitive wage differentials, where workers use their bargaining power to extract rents from firms. In this context, the "wage-equals-VMPL" condition may not hold when (i) the union is concerned about the level of employment in the primary sector (i.e. about the number of union members who have access to the rents) and (ii) the union and the firm can reach an enforceable agreement over wages and employment. This is because the union and the primary firm tend to trade off a lower wage for higher employment, possibly leading to primary sector over-employment. This distortion is qualitatively different from that in the efficiency wage case, leading to a primary sector VMPL below that in the secondary sector. On the other hand, if the union does not care about increasing primary sector jobs or if union-firm bargains over employment are not enforceable, primary sector employment would be suboptimal, as in the efficiency wage case.

2. EVIDENCE ON INTERINDUSTRY WAGE DIFFERENTIALS

The idea that workers with similar abilities and skills could obtain jobs with very different wages independently of their job preferences was widely accepted among labour economists in the early post-war period. For example, Dunlop (1957) found that, in Boston, truck drivers in some

industries earned over twice the hourly rate of those in other industries in 1951. Other prominent labour economists such as Slichter (1950) also found large and systematic wage differences across industries for workers with similar observed characteristics, working in the same well-defined job classification and in the same locality. These large wage differentials were also found to persist over time.[2] Although it was accepted that a part of these wage differentials was due to differences in labour quality, they argued that managerial discretion and "ability to pay" were important determinants of industry wage rates. On this basis, they concluded that product market characteristics were a major influence on industry wage rates.

As competitive theories became increasingly popular in labour economics in the 1970s, researchers tended to rule out the idea that workers in some industries could earn rents. It was argued that there was no reason why a rational profit-maximizing firm would pay workers more than what was required to secure their services. Nor was it accepted that a firm's ability to pay could influence its wage policy. Hence, any empirical evidence on wage differentials was simply thought to reflect unmeasured factors, such as unobservable human capital characteristics and worker preferences for job characteristics (e.g. Bhagwati and Ramaswami (1963)).

2.1 U.S. Evidence

Empirical evidence on interindustry wage differences re-emerged with the development of efficiency wage theories in the 1980s. Evidence from the U.S. is provided by Katz and Summers (1989), who use cross-sectional data on employees from the private, non-agricultural sector (Current Population Survey 1984) in order to examine the importance of industry affiliation in explaining relative wages. They present OLS regressions of the wage (constructed as usual weekly earnings divided by usual weekly hours) on two-digit industry dummy variables. The estimated wage differentials are normalized as deviations from the (employment-weighted) mean differential.

The first column in Table 1 shows the proportionate difference in wages between the average worker in a two-digit industry and the average worker in all industries, without controlling for the quality of workers across industries. A positive coefficient indicates an industry with a higher-than-average wage, while a negative one indicates the opposite. For example, the coefficient for the mining industry indicates that the average wage there is 41% higher than the (employment-weighted) average wage for workers in all industries. The results show that in the U.S., the petroleum, public utilities, mining and communications industries lie at the top of the wage distribution, while private household services, eating and drinking and leather goods industries lie at the low end of the distribution.

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[2] Other stylized facts uncovered included that average hourly earnings for unskilled workers by industry were strongly positively correlated with profit margins and industry value added per worker, and negatively correlated with the ratio of payroll to sales.

The second column shows industry wage differentials after controlling for worker characteristics such as education, experience, broad occupational category (one-digit level), gender, marital status, region, full-time work, and student status, and interaction dummies to allow some of these coefficients to differ for males and females. These controls reduce significantly the estimated interindustry dispersion of wages. The employment-weighted standard deviation of interindustry wage differentials falls from 28% without controls to 15% with controls, with most of this due to holding broad occupation, region, race and sex constant.[3] Therefore, industry affiliation has a large effect on relative wages even after accounting for observed differences in occupation, human capital variables and demographic background. The interindustry wage differentials (with controls) range from a high of 29% above the mean in petroleum to 36% below the mean in private household services. Durable goods manufacturing, mining and chemical industries pay wages well above those for workers in the retail trade and service industries.

The U.S. interindustry wage differentials (with and without controls) are reproduced in ascending order in Figure 1. One can easily see that the introduction of controls for worker attributes compresses the (unexplained) wage differentials. Moreover, the industry rankings in the wage structure remain largely unchanged after introducing controls. The petroleum, public utilities, mining and communications industries remain at the top end of the wage distribution, while private household services and eating and drinking remain at the low end of the distribution.[4] Hence, the industries that pay high wages also tend to be the ones that provide higher job rents.

It could still be argued that these wage differentials do not reflect the presence of rents for workers in high-wage industries. One such argument is that the estimated differentials offset differences in nonwage compensation. After adjusting the dependent variable to control for fringe benefits[5] -which accounts for 50% of compensation in some industries - Katz and Summers (1989) show that the standard deviation actually increases from 15% to 19% (column 3 in Table 1). Thus, in the case of the U.S., accounting for nonwage compensation reinforces, rather than reduces, interindustry wage differentials.

Another potential explanation for the large interindustry wage differences is that the broad (one-digit) occupational category included as a control variable does not capture much of the differences in skill requirements across industries. Katz and Summers (1989:220-23) address this possibility by re-estimating the wage differentials for each of the three-digit occupational categories of managers and administrators, secretaries, janitors and labourers (not shown). Even at this level of occupational detail, the standard deviation of the unexplained two-digit interindustry differentials remains large, ranging from 9.2% for secretaries to 16.8% for janitors.

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[3] This is a conservative estimate of the unexplained variation in interindustry wage differentials to the extent that controls such as race and gender capture non-competitive wage differentials.

[4] On this basis, Katz and Summers suggest that comparisons of industry wages over time and across countries may be useful, since controls do not change industry rankings.

[5] This was done by multiplying the hourly wage for each worker in the sample by the ratio of total labour costs to wages (drawn from the national income and product accounts) in the corresponding industry.

TABLE 1

Estimated Natural Log Wage Differentials between Workers in Selected and All U.S. Industries, 1984

	Industries			
Industry[b]	*All, without controls* (1)	*All, with controls*[c] (2)	*All, total compensation with controls*[c] (3)	*Nonunion with Controls*[c] (4)
Mining	0.411	0.267	0.277	0.269
Construction	0.181	0.120	0.106	0.061
Lumber	-0.102	-0.046	-0.011	-0.009
Furniture	-0.107	-0.042	-0.023	-0.004
Stone, clay, glass	0.097	0.066	0.117	0.057
Primary metals	0.280	0.164	0.262	0.156
Fabricated metals	0.138	0.072	0.131	0.071
Machinery, except electrical	0.311	0.146	0.182	0.170
Electrical machinery	0.188	0.083	0.110	0.099
Transportation equipment	0.388	0.207	0.282	0.187
Instruments	0.258	0.105	0.132	0.147
Miscellaneous manufacturing	-0.087	-0.063	-0.044	-0.022
Food	0.051	0.050	0.101	0.035
Tobacco	0.260	0.240	0.426	0.219
Textiles	-0.134	-0.004	0.007	0.045
Apparel	-0.347	-0.152	-0.150	-0.113
Paper	0.234	0.164	0.199	0.140
Printing	0.067	0.027	0.029	0.023
Chemical	0.354	0.188	0.231	0.214
Petroleum	0.501	0.286	0.533	0.280
Rubber	0.103	0.093	0.136	0.121
Leather	-0.282	-0.137	-0.118	-0.097
Transportation	0.225	0.157	0.184	0.077
Communications	0.400	0.250	0.371	0.213
Public utilities	0.443	0.267	0.342	0.265
Wholesale trade	0.123	0.035	0.011	0.050
Eating and drinking	-0.592	-0.251	-0.283	-0.237
Other retail trade	-0.251	-0.140	-0.173	-0.144
Banking	0.110	0.050	0.077	0.062
Insurance	0.121	0.050	0.052	0.067
Private household	-0.808	-0.356	-0.508	-0.331
Business services	-0.002	-0.021	-0.053	-0.008
Repair services	-0.063	-0.091	-0.123	-0.064
Personal services	-0.371	-0.182	-0.223	-0.167
Entertainment	-0.176	-0.125	-0.149	-0.146
Medical services	-0.160	-0.038	-0.036	-0.018
Hospitals	0.115	0.073	0.075	0.081
Welfare services	-0.191	-0.243	-0.328	-0.242
Education services	-0.011	-0.171	-0.194	-0.176
Professional services	0.276	0.095	0.054	0.101
Sample size	116,387	116,387	116,387	95,793
Weighted adjusted standard deviation of differentials[d]	0.284	0.151	0.193	0.146

SOURCE: **Katz and Summers** (1989 :218-19) using the Full Year 1984 CPS.

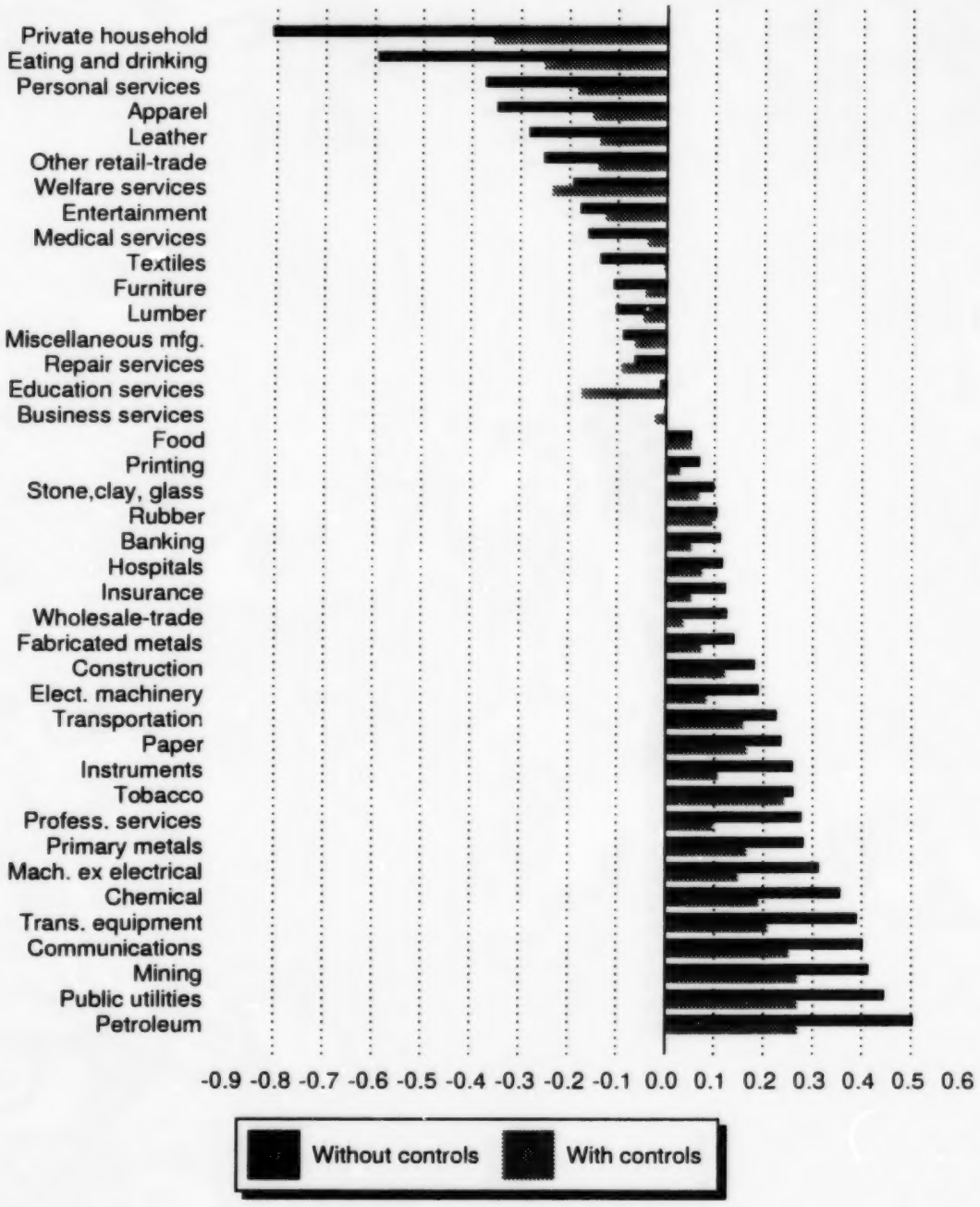
a. In all cases the standard errors are between 0.006 and 0.027 except for tobacco, which has standard errors that rage from 0.039 to 0.049.

b. Two-digit CIC industries.

c. Controls comprise education and its square; experience (age - education - 6), its square, and its cube; eight occupation dummies; a female dummy; a race dummy; an SMSA dummy; three region dummies; a full-time work dummy; full and part-time student dummies; interactions of the female dummy with marriage, education, education squared, and the experience variables, and a constant. Each column was estimated from a separate cross-sectional regression.

d. Weights are employment shares for the entire sample (union and nonunion).

Figure 1
ESTIMATED NATURAL LOG WAGE DIFFERENTIALS, U.S. INDUSTRIES (1984), WITH AND WITHOUT CONTROLS



Interindustry wage differentials can also arise due to differences in union bargaining power across industries. Katz and Summers re-estimate the wage differentials (with controls) for a sample containing only nonunion workers and find that the wage premiums remain quite substantial (column 4). They also estimate the differentials for the union workers in their sample (not shown) and find that the standard deviation for both samples is 14.6%. They conclude from this that the process generating interindustry wage differentials appears to be the same in the union and nonunion sectors.

2.2 Canadian Evidence

Gera and Grenier (1994) provide similar Canadian evidence for the view that interindustry wage differentials reflect rents for high-wage workers. Using the same estimation method as Katz and Summers (1989), Gera and Grenier show that after controlling for workers' human capital and demographic characteristics, industry wages at the two-digit level range from 33% above the weighted average in tobacco products to 32% below in religious organizations (Table 2).[6] If the level of significance of the coefficient is greater than 90%, the industry is classified either as "low-wage" or "high-wage". Otherwise, the industry is classified as "medium-wage". On this basis, primary[7] industries are in the high-wage sector, with the exception of fishing and trapping which are low-wage industries. The manufacturing sector pays somewhat above average, although textiles, furniture and leather industries are in the low-wage sector. "Other services" consist mainly of low-wage industries, although services to business management is a high-wage industry. These interindustry wage differentials are ranked in ascending order in Figure 2, indicating that job rents tend to be found mainly in manufacturing and primary industries. Moreover, at this two-digit level of disaggregation, the Canadian industry wage structure is broadly similar to that of the U.S.. The standard deviation of the wage differentials is identical to that in Katz and Summers (1989) - 15% (Table 2).

In contrast to Katz and Summers (1989), the data available to Gera and Grenier (1991) does not allow them to examine whether the estimated wage differentials are offset by differences in nonwage compensation across industries. Nevertheless, they are able to explore other competitive explanations for these wage differentials. For instance, interindustry wage differences could reflect compensating differentials for nonwage job attributes that directly affect the utility of workers (eg. job satisfaction, health and safety conditions). Or, they could reflect differences in the mix of skill requirements across industries. Gera and Grenier argue that the differentials arising from these competitive factors should be smaller when applied to a subgroup of workers that is homogeneous in terms of tasks performed than when applied to all workers, as in Table 2. To examine this hypothesis, Gera and Grenier re-estimate the interindustry wage differentials separately for white-collar and blue-collar workers (Table 3). Although some of the coefficients

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[6] The weights are industry employment shares for 1986.

[7] In this instance, "primary" refers to resource-based industries. This is not to be confused with the term "primary sector", which refers to those industries paying wage premiums.

TABLE 2

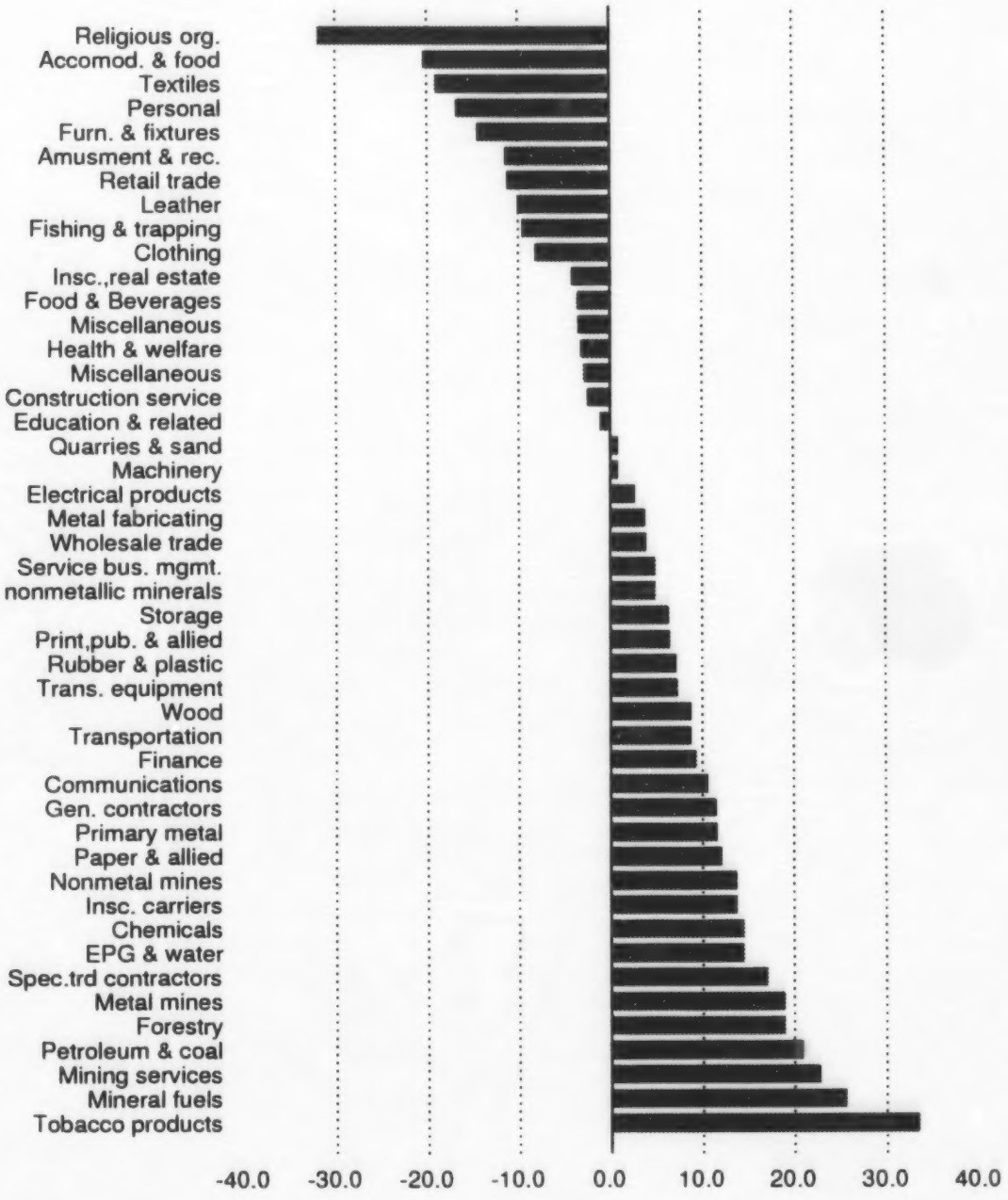
Wages Relative to the Industrial Average by Industry, Canada, 1986

	Wage status	(Per cent)
Other primary		
Forestry	High	18.9
Fishing and trapping	Low	-9.5
Metal mines	High	18.9
Mineral fuels	High	25.5
Nonmetal mines	High	13.7
Quarries and sand pits	Medium	0.8
Services incidental to mining	High	22.7
Manufacturing		
Food and beverages	Low	-3.5
Tobacco products	High	33.4
Rubber and plastics	High	7.1
Leather	Low	-10.0
Textiles	Low	-19.0
Clothing	Low	-8.1
Wood	High	8.7
Furniture and fixtures	Low	-14.4
Paper and allied	High	12.0
Printing, publishing, and allied	High	6.4
Primary metal	High	11.5
Metal fabricating	High	3.7
Machinery	Medium	0.8
Transportation equipment	High	7.2
Electrical products	High	2.6
Nonmetallic mineral	High	4.8
Petroleum and coal products	High	20.8
Chemical and chemical products	High	14.4
Miscellaneous	Medium	-3.4
Construction		
General contractors	High	11.4
Special-trade contractors	High	17.0
Service industries incidental to construction	Medium	-2.4
Transportation, communications, and utilities		
Transportation	High	8.7
Storage	Medium	6.3
Communications	High	10.5
Electric power, gas, and water utilities	High	14.4
Trade		
Wholesale	High	3.8
Retail	Low	-11.1
Finance, insurance, and real estate		
Finance	High	9.3
Insurance carriers	High	13.7
Other services		
Education and related	Medium	-1.0
Health and welfare	Low	-3.1
Religious organizations	Low	-31.8
Amusement and recreation	Low	-11.4
Services to business management	High	4.8
Personal	Low	-16.7
Accommodation and food	Low	-20.3
Miscellaneous	Low	-2.8
SAMPLE SIZE		32,945
WEIGHTED ADJUSTED STANDARD DEVIATION OF DIFFERENTIALS		0.151

See Notes at end of Table 3.

SOURCE: Gera and Grenier (1994).

Figure 2
ESTIMATED INTERINDUSTRY WAGE DIFFERENTIALS (Per cent), WITH CONTROLS FOR WORKER ATTRIBUTES (Canada 1986)



change in magnitude and even in sign (relative to Table 2), the classification of industries by high/low wage status (i.e. by tendency to pay job rents) remains the same in the majority of cases. If the estimated interindustry wage differentials in Table 2 were really due to the competitive rationales described above, one would see a drop in the dispersion of unexplained interindustry differentials for more homogeneous subgroups of workers. In fact, the weighted adjusted standard deviation of differentials actually increases for white-collar workers and it decreases only slightly for blue-collar workers (relative to that for all workers).

Figure 3 gives the graphic representation of the data in Table 3 data. It shows that the wage structure does not differ significantly between white- and blue-collar workers. When one type of worker receives job rents, so does the other type to a greater or lesser degree.

Gera and Grenier apply a further control for competitive explanations by estimating the industry differentials for three occupations: managerial, clerical and fabrication. Contrary to what would have been expected from competitive rationales for the interindustry wage differentials, their results in Table 4 show that the differentials remain large even for specific occupations and that the standard deviation of the differentials for each occupation is higher than for workers as a whole. The implication is that certain industries pay job rents that are not easily explained away by standard competitive theories. Moreover, by representing graphically the interindustry wage differentials for the fabrication and clerical workers, it becomes clear that these specific occupations tend to experience similar interindustry wage differentials (Figure 4). This stylized fact can also be generalized to other occupations. Industries that pay job rents tend to do so for all occupations, albeit perhaps in different degrees.

Gera and Grenier (1994) carried out further estimates in an attempt to narrow down the possible explanations for interindustry wage differentials. Unions are one factor that may account for wage dispersion across industries, since union bargaining power can vary across industries due to variations in the wage elasticity of labour demand. If interindustry wage differentials are indeed due to this factor, one would expect a lower standard deviation for the subsample of nonunion employees. Yet, Gera and Grenier find that the standard deviation for the nonunion sample is 0.177, compared to 0.151 for all workers. As for the standard deviation of interindustry wage differentials for union employees, it is considerably lower (0.119) - unlike the U.S. where the statistic is similar for both the union and nonunion samples (i.e. 0.146). This leads the authors suggest that the extent of unionization is not a major factor explaining Canadian interindustry wage differentials.[8]

[8] This conclusion may be qualified because the analysis does not account for the spill-over effects of unions on nonunion firms in the same industry, given that such spill-over effects can differ by industry. On this issue, Krueger and Summers (1988) cite Dickens' (1986) union threat model, which suggests that different costs of union avoidance across industries lead some firms to pay premiums to prevent unionization. They argue that time series evidence for the U.S. does not support this explanation of interindustry wage differences, because the industry wage structure has remained remarkably stable despite the decline in unionization since the 1970s.

TABLE 3

Estimated Wage Differentials for Two-Digit Industries (Weighted OLS) - Labour Market Activity Survey, 1986

	Wage status	White-collar	Blue-collar
		(Standard errors in parentheses)	
Other primary			
Forestry	High	0.114	0.138
		(0.065)	(0.029)
Fishing and trapping	Low	0.278	-0.194
		(0.138)	(0.046)
Metal mines	High	0.101	0.183
		(0.047)	(0.027)
Mineral fuels	High	0.302	0.160
		(0.035)	(0.035)
Nonmetal mines	High	0.176	0.065
		(0.126)	(0.079)
Quarries and sand pits	Neither	-0.001	-0.025
		(0.221)	(0.072)
Services incidental to mining	High	0.236	0.166
		(0.064)	(0.037)
Manufacturing			
Food and beverages	Low	-0.081	-0.054
		(0.026)	(0.014)
Tobacco products	High	0.267	0.384
		(0.094)	(0.106)
Rubber and plastics	High	0.109	0.020
		(0.039)	(0.025)
Leather	Low	-0.019	-0.139
		(0.081)	(0.039)
Textiles	Low	-0.124	-0.231
		(0.058)	(0.028)
Knitting mills	NA	NA	NA
Clothing	Low	0.112	-0.159
		(0.038)	(0.022)
Wood	High	0.067	0.032
		(0.045)	(0.020)
Furniture and fixtures	Low	-0.160	-0.186
		(0.056)	(0.026)
Paper and allied	High	0.191	0.049
		(0.038)	(0.020)
Printing, publishing, and allied	High	0.050	0.072
		(0.024)	(0.023)
Primary metal	High	0.221	0.036
		(0.038)	(0.019)
Metal fabricating	High	0.033	0.013
		(0.036)	(0.018)
Machinery	Neither	0.028	-0.029
		(0.038)	(0.029)
Transportation equipment	High	0.087	0.029
		(0.027)	(0.014)
Electrical products	High	0.059	-0.016
		(0.025)	(0.020)
Nonmetallic mineral	High	-0.059	0.020
		(0.079)	(0.030)
Petroleum and coal products	High	0.095	0.318
		(0.058)	(0.058)
Chemical and chemical products	High	0.148	0.119
		(0.031)	(0.028)
Miscellaneous	Neither	0.026	-0.084
		(0.041)	(0.031)
Construction			
General contractors	High	0.084	0.087
		(0.030)	(0.017)
Special-trade contractors	High	0.111	0.138
		(0.033)	(0.015)
Service industries incidental to construction	Neither	-0.033	0.055
		(0.082)	(0.158)
Transportation, communications, and utilities			
Transportation	High	0.131	0.019
		(0.018)	(0.011)
Storage	Neither	0.071	0.034
		(0.06)	(0.077)
Communications	High	0.142	0.048
		(0.015)	(0.025)
Electric power, gas, and water utilities	High	0.169	0.101
		(0.030)	(0.026)
Trade			
Wholesale	High	0.046	-0.015
		(0.012)	(0.017)
Retail	Low	-0.123	-0.089
		(0.008)	(0.012)
Finance, insurance, and real estate			
Finance	High	0.106	-0.114
		(0.013)	(0.116)
Insurance carriers	High	0.149	-0.319
		(0.021)	(0.304)
Insurance agencies, real estate	Low	-0.022	-0.123
		(0.017)	(0.072)
Other services			

TABLE 3 (Continued)

	Wage status	White-collar	Blue-collar
		(Standard errors in parentheses)	
Other services			
Education and related	Neither	0.028	-0.065
		(0.011)	(0.035)
Health and welfare	Low	0.043	-0.827
		(0.008)	(0.032)
Religious organizations	Low	-0.310	0.105
		(0.027)	(0.153)
Amusement and recreation	Low	-0.088	-0.138
		(0.022)	(0.045)
Services to business management	High	0.058	0.093
		(0.011)	(0.037)
Personal	Low	-0.157	-0.122
		(0.019)	(0.057)
Accommodation and food	Low	-0.181	-0.290
		(0.010)	(0.044)
Miscellaneous	Low	-0.014	-0.040
		(0.167)	(0.030)

SAMPLE SIZE	21,273	11,671
WEIGHTED ADJUSTED STANDARD DEVIATION OF DIFFERENTIALS	0.189	0.136
R^2	0.483	0.46
SPEARMAN CORRELATION COEFFICIENT	0.49	

Each column is estimated from a separate cross-sectional regression.

1 Other than the industry dummies, explanatory variables include five education dummies, one head dummy, six age dummies, three marital status dummies, one sex dummy, one education/sex interaction, six age/sex interactions, one marital status/sex interaction, 13 occupation dummies, five regional dummies, one union membership dummy, one job tenure dummy, four employer size dummies, one full-time/part-time job dummy, and a constant.

2 Weights are employment shares for 1986.

SOURCE: Gera and Grenier (1994).

Figure 3
ESTIMATED INTERINDUSTRY WAGE DIFFERENTIALS FOR WHITE- AND BLUE-COLLAR WORKERS WITH CONTROLS FOR WORKER ATTRIBUTES (Per cent), Canada 1986

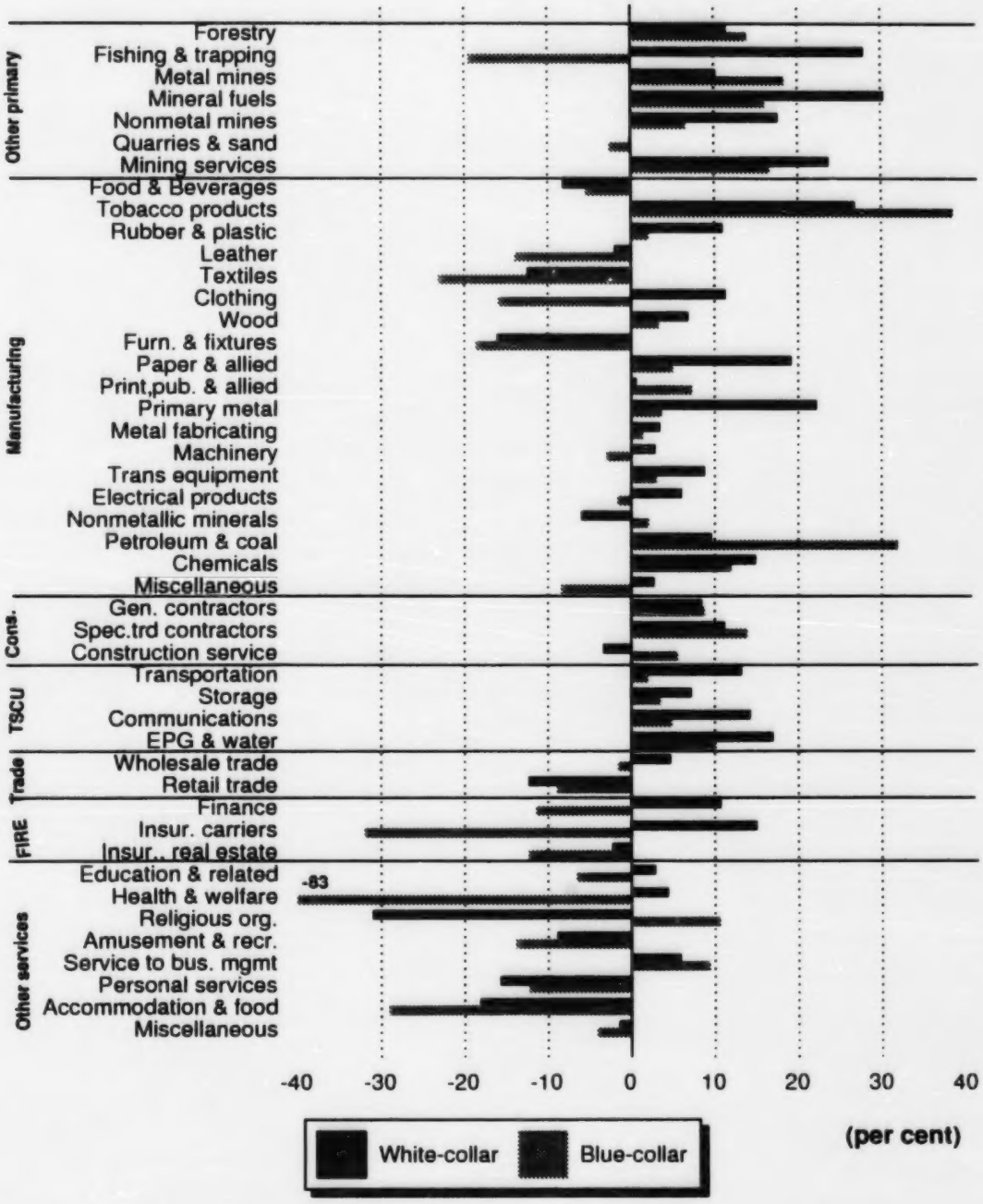


TABLE 4

Estimated Wage Differentials for Three Occupational Groups (Weighted OLS) - Labour Market Activity Survey, 1986

Industry	Wage Status	Managerial	Fabrication	Clerical
		(Standard errors in parentheses)		
Other Primary				
Forestry	High	0.071	0.203	0.059
		(0.161)	(0.112)	(0.094)
Fishing and trapping	Low	-0.301	0.033	0.477
		(0.796)	(0.824)	(0.178)
Metal mines	High	0.048	0.319	0.278
		(0.121)	(0.070)	(0.107)
Mineral fuels	High	0.242	0.172	0.244
		(0.078)	(0.098)	(0.071)
Non-metal mines	High	0.224	0.114	-0.040
		(0.191)	(0.175)	(0.246)
Querries and sand pits	Neither	NA	-0.052	-0.103
			(0.234)	(0.510)
Services incidental to mining	High	0.254	0.177	0.112
		(0.150)	(0.158)	(0.103)
Manufacturing				
Food and beverage industries	Low	-0.190	0.143	-0.102
		(0.059)	(0.054)	(0.035)
Tobacco products industries	High	0.436	0.389	0.095
		(0.266)	(0.176)	(0.143)
Rubber and plastic industries	High	0.084	0.061	0.078
		(0.089)	(0.036)	(0.048)
Leather industries	Low	-0.051	-0.083	-0.164
		(0.126)	(0.047)	(0.140)
Textile industries	Low	-0.288	-0.285	-0.149
		(0.126)	(0.052)	(0.074)
Knitting mills	NA	NA	NA	NA
Clothing industries	Low	0.275	-0.117	-0.034
		(0.078)	(0.028)	(0.071)
Wood industries	High	0.063	0.135	-0.008
		(0.093)	(0.042)	(0.072)
Furniture and fixture industries	Low	-0.011	-0.165	-0.246
		(0.132)	(0.036)	(0.088)
Paper and allied industries	High	0.215	0.077	0.140
		(0.101)	(0.045)	(0.0153)
Printing, publishing, and allied industries	High	-0.031	0.034	0.056
		(0.068)	(0.098)	(0.042)
Primary metal industries	High	0.209	0.171	0.179
		(0.098)	(0.049)	(0.056)
Metal fabricating industries	High	-0.080	0.043	0.056
		(0.069)	(0.041)	(0.047)
Machinery industries	Neither	-0.137	-0.057	-0.090
		(0.072)	(0.052)	(0.062)
Transportation equipment industries	High	-0.007	0.111	0.163
		(0.061)	(0.020)	(0.040)
Electrical products industries	High	0.003	0.060	0.082
		(0.045)	(0.024)	(0.045)

Table 4 (Continued)

Industry	Wage Status	Managerial	Fabrication	Clerical
Non-metallic mineral products	High	-0.354	0.139	0.144
		(0.158)	(0.083)	(0.132)
Petroleum and coal products industries	High	0.195	0.380	0.130
		(0.131)	(0.191)	(0.112)
Chemical and chemical products industries	High	0.162	0.062	0.050
		(0.068)	(0.086)	(0.048)
Miscellaneous manufacturing industries	Neither	0.121	0.010	-0.086
		(0.091)	(0.045)	(0.066)
Construction				
General contractors	High	-0.068	0.152	0.149
		(0.064)	(0.092)	(0.041)
Special-trade contractors	High	0.049	0.247	0.039
		(0.080)	(0.053)	(0.040)
Service industries incidental to construction	Neither	-0.132	NA	0.014
		(0.124)		(0.130)
Transportation, communications, and utilities				
Transportation	High	0.104	0.122	0.030
		(0.046)	(0.032)	(0.023)
Storage	Neither	0.239	0.091	-0.020
		(0.121)	(0.165)	(0.075)
Communication	High	0.080	0.052	0.127
		(0.039)	(0.079)	(0.019)
Electric power, gas, and water utilities	High	0.051	0.024	0.170
		(0.078)	(0.078)	(0.039)
Trade				
Wholesale trade	High	0.026	0.024	-0.021
		(0.028)	(0.034)	(0.018)
Retail trade	Low	-0.124	-0.067	-0.128
		(0.019)	(0.019)	(0.012)
Finance, insurance, and real estate				
Finance industries	High	0.090	NA	0.039
		(0.024)		(0.014)
Insurance carriers	High	0.112	NA	0.040
		(0.049)		(0.028)
Insurance agencies, real estate industries	Low	-0.142	-0.246	0.060
		(0.047)	(0.209)	(0.035)
Other services				
Education and related services	Neither	-0.030	-0.032	-0.015
		(0.035)	(0.089)	(0.019)
Health and welfare services	Low	0.160	-1.165	0.021

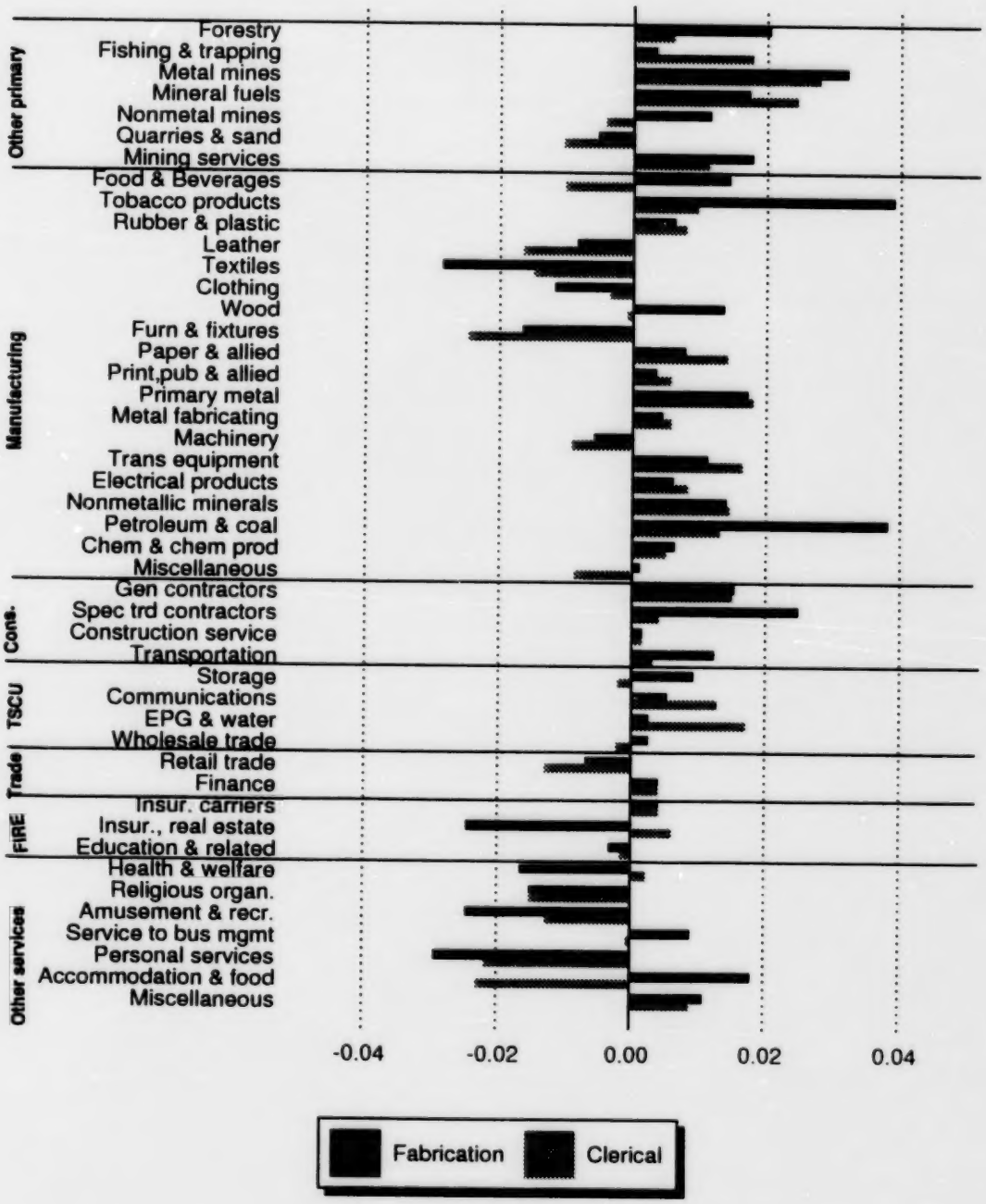
Table 4 (Continued)

Industry	Wage Status	Managerial	Fabrication	Clerical
		(0.035)	(0.058)	(0.016)
Religious organizations	Low	-0.707	NA	-0.150
		(0.106)		(0.050)
Amusement and recreation services	Low	-0.086	-0.245	-0.127
		(0.070)	(0.098)	(0.038)
Services to business management	High	0.087	0.088	-0.005
		(0.028)	(0.072)	(0.016)
Personal services	Low	-0.333	-0.293	-0.217
		(0.118)	(0.087)	(0.060)
Accomodation and food services	Low	-0.183	0.179	-0.229
		(0.033)	(0.301)	(0.029)
Miscellaneous services	Low	0.023	0.108	0.088
		(0.043)	(0.074)	(0.028)
Weighted adjusted standard deviation of differentials		0.182	0.204	0.159
Sample size		3,345	2,815	5,463
R^2		0.376	0.514	0.346

See Table 3 notes. Each column is estimated from a separate cross-sectional regression.

SOURCE: Gera and Grenier (1994)

Figure 4
ESTIMATED INTERINDUSTRY WAGE DIFFERENTIALS FOR FABRICATION AND CLERICAL WORKERS, Canada 1986



2.3 Interindustry Wage Differentials as Unmeasured Differences in Labour Quality

After controlling for the available human capital and demographic variables, the question arises as to whether the remaining (unexplained) interindustry wage differentials represent true rents or unmeasured differences in workers' productive abilities across industries. In other words, do unmeasured factors such as innate ability and motivation explain the remaining wage differentials, implying that workers in high-wage industries are better workers rather than recipients of job rents? This issue has critical implications for the analysis of labour market distortions. If interindustry wage differentials do not represent rents, it follows that marginal labour productivity cannot be distorted across industries.

The relative importance of unobserved differences in labour quality is very difficult to determine empirically. One indirect method suggested by Krueger and Summers (1988:268-69) is that if the observed interindustry wage variation is due to both measured and unmeasured differences in labour quality across industries, one would expect a significant fall in wage dispersion after controlling for measured human capital. However, the addition of human capital controls - age, education and tenure - leads only to a small drop in wage dispersion. This exercise was carried out for Canada with similar results (Gera and Grenier 1994). Table 5 shows that the standard deviation of wage differentials drops by only 3.4 percentage points after adding three sets of human capital controls, remaining as high as 15%. In order to attribute the remaining (unexplained) variation in interindustry wage differentials to unmeasured differences in labour quality, one must be prepared to believe that the variation in unmeasured labour quality is vastly greater than that of the measured quality variables. Moreover, to the extent that the measured and unmeasured differences in labour quality are positively correlated (i.e. industries that rely on more-able workers also rely on more-educated workers), one would expect an even greater drop in the interindustry wage variation after adding the human capital controls. That this did not materialize implies that unmeasured differences in labour quality are not likely to be an important explanation of the cross-section estimates of interindustry wage differentials.

A second method of assessing the importance of this competitive explanation of wage differentials is to use longitudinal data on individuals in order to assess whether job-movers who change industries experience wage changes in line with the cross-sectional estimates. This allows one to account for the kind of unmeasured labour quality which does not vary over time and which is equally valued across all industries. On this basis, both Krueger and Summers (1988) for the U.S. and Gera and Grenier (1994) for Canada find that workers moving from high- to low-wage industries experience a wage decrease similar to the cross-section estimates of the interindustry wage differentials, while those moving from low- to high-wage industries experience

TABLE 5

Alternative Degrees of Control for Human Capital on Industry Wage Differentials - Labour Market Activity Survey, 1986

Control:	Weighted adjusted standard deviation of industry wage differentials[1]
Head dummy, marital status dummies, sex dummy, marital status/sex interactions, 13 occupation dummies, five region dummies, union dummy, employer size, full-time dummy	0.188
Row 1 controls plus six age dummies and one age/sex interaction	0.170
Row 2 controls plus five education dummies and one education/sex interaction	0.154
Row 3 controls plus tenure variable	0.151

1 Based on estimated industry wage differentials for two-digit industries.

SOURCE: Gera and Grenier (1991).

the predicted wage increases.[9] This suggests that the cross-section estimates reviewed earlier represent true wage differentials.

The problem with the studies above is that they do not control for *the kind of unmeasured labour quality which is valued differently across industries*. For example, labour productivity and firm profitability may be more sensitive to worker motivation in some industries than it is in others. Gibbons and Katz (1992) develop a model in which interindustry wage differentials arise among observably identical workers by virtue of the process whereby workers and firms search for their most productive matches. The idea is that the market perception of a match between a worker's ability and each industry's technology may vary over time as new information about the productivity of a match becomes available to both the worker and the firm. Hence, a worker who obtains the predicted wage premium by moving from a low- to a high-wage industry may in fact simply have found (i.e. self-selected into) an industry which attaches greater value to her unmeasured abilities. This means that the longitudinal estimates described above may be heavily biased due to the self-selection behaviour arising from endogenous job change decisions. Gibbons and Katz (1992) attempt to control for these biases by restricting their U.S. sample to workers displaced by plant closings, which is a very good indicator of exogenous job loss. They find that the wage changes experienced by these displaced workers are similar to the cross-sectional interindustry wage differentials, thus giving support to the job rents hypothesis. On the other hand, further analysis of the same data suggests that workers tend to retain about 45% of the wage premium they enjoyed in their pre-displacement industry once they are re-employed - which supports the unobserved ability hypothesis. Although certain awkward explanations exist to reconcile this finding with the job rents hypothesis, it suffices to conclude that the most conservative estimate of the true interindustry wage variation is at least half that found through the cross-section estimates surveyed in section 2.1.

Further work remains to be done on the role of unmeasured differences in labour quality, especially for Canada. Yet, the Gibbons-Katz (1992) study suggests that in the case of the U.S. this factor cannot explain the bulk of the estimated interindustry wage differentials. At least half the interindustry wage differentials estimated after controlling for human capital and demographic variables represent job rents. This could imply that there are indeed distortions in the marginal productivity of labour across industries, a qualitative conclusion likely to hold also for Canada.

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[9] Murphy and Topel (1990) also use this method, but they find that industry-movers experience only between 27% and 36% of the cross-sectional wage differentials, thus concluding that almost two-thirds of the observed industry differences are explained by unmeasured labour quality. Perhaps one reason for this much lower estimate is that the authors use information on workers' aggregate annual earnings (i.e. across all jobs held in the year) and on their main industry affiliation for the year, rather than on their earnings and industry location at one point in time. Given that the two annual earnings measures used to construct the wage change variable are likely to contain earnings from the same job, the estimated impact of a change in industry on the worker's change in earnings is most probably downward-biased.

2.4 Empirical Regularities in the Interindustry Wage Structure

Further to the empirical regularities reviewed in sections 2.1 and 2.2, there is evidence that the interindustry wage structure is generated by a systematic process - such as efficiency wages - that appears stable over time and is similar across developed countries. The stability of the industry wage structure over time was first noted by Slichter (1950), who examined the U.S. interindustry wage structure between 1923 and 1946. Recent research confirms this finding by showing that the cross-section estimates of wage differentials are stable over periods of more than a decade. Gera and Grenier (1994) found similar results for Canada using census data for 1970, 1980 and 1985 (Table 6). In all three years, "other primary industries" paid the highest wages and "trade" paid the lowest, while the ranking of other industries changed only moderately.

The similarity of the wage structure across developed economies is even more significant an empirical regularity. Table 7 shows that the natural log of manufacturing wages for the nine selected countries are highly correlated. This tends to rule out any explanation of interindustry wage differentials based on institutional differences across economies. In this sense, it lends more support to efficiency-wage rationales for the industry wage structure than it does to rent-sharing explanations, which may be more likely to vary with institutional differences.[10] Efficiency wage considerations driven by monitoring costs, labour turnover costs, or even by adverse selection constraints are more likely to arise from fundamental factors related to production technology and hence, are more likely to affect developed economies in a similar way, as compared to institutionally-sensitive explanations for job rents. These various explanations for interindustry wage differentials are examined at greater length in the next two sections.

3. EFFICIENCY WAGE RATIONALES FOR INTERINDUSTRY WAGE DIFFERENCES

There are many reasons why firms may knowingly pay wages in excess of opportunity cost even to workers with no bargaining power. Alternatively, there are many theories about why firms may not reduce wages when faced with a queue of applicants willing to work for lower wages. Each of these theories is a possible explanation for the non-competitive interindustry wage differentials reviewed above. Efficiency wage theories assume that market power lies entirely with the firm. Hence, a firm may willingly offer wage premiums if the profitability of its employees depends on their wage, due to the presence of incentive considerations (eg. eliciting greater effort), selection considerations (i.e. obtaining more able workers), work norms based on fairness considerations, or even nutritional considerations.

[10] For example, to the extent that job security regulations differ across countries, insider-outsider theory predicts that workers will extract the highest wage premiums in places where firms incur the highest costs for layoffs, dismissals and new hires (Lindbeck and Snower 1988).

TABLE 6

Estimated Wage Differentials for One-Digit Industries[1], Canada, 1970, 1980, and 1985

	1970	1980	1985
		(Standard errors in parentheses)	
Other primary	.234	.270	.313
	(.032)	(.030)	(.033)
Manufacturing	.062	.043	.068
	(.010)	(.010)	(.011)
Construction	.115	.082	.042
	(.022)	(.022)	(.025)
Transportation, communications, and utilities	.105	.129	.147
	(.015)	(.015)	(.016)
Trade	-.104	-.112	-.108
	(.012)	(.011)	(.012)
Finance, insurance, and real estate	.030	.038	.051
	(.021)	(.017)	(.018)
Other services	-.092	-.065	-.070
	(.011)	(.010)	(.009)
R^2	.666	.573	.539
Weighted adjusted standard deviation of differentials[2]	.105	.090	.102
Sample size	14,994	17,433	19,161

1 The other explanatory variables include education, experience, experience squared marital status, four dummies for weeks worked, six dummies for hours worked per week, a sex dummy, a sex dummy interacted with education, experience and marital status, 15 occupation dummies, and four regional dummies.

2 Weights are the employment shares in each census.

Data source: Canadian Censuses, 1971, 1981, and 1986, public-use samples, individual files (random sample of 1/4 in 1971 and of 1/8 in 1981 and 1986).

SOURCE: Gera and Grenier (1994).

TABLE 7

Correlations of Natural Log Manufacturing Wages among Nine Countries, 1983[a]

Country	*Australia (year)*	*Chile (year)*	*France (hour)*	*Germany (hour)*	*Japan (year)*	*Korea (hour)*	*Sweden (year)*	*United Kingdom (year)*	*United States (hour)*
Australia	1.00	0.66	0.80	0.81	0.84	0.67	0.77	0.78	0.92
Chile	...	1.00	0.60	0.60	0.69	0.46	0.67	0.56	0.67
France	...	...	1.00	0.89	0.80	0.53	0.64	0.77	0.85
Germany	...	...	...	1.00	0.94	0.62	0.75	0.93	0.95
Japan	...	...	...	...	1.00	0.59	0.80	0.95	0.92
Korea	...	...	...	...	...	1.00	0.68	0.59	0.66
Sweden	...	...	...	...	...	...	1.00	0.79	0.79
United Kingdom	...	...	...	...	...	...	...	1.00	0.86
United States	...	...	...	...	...	...	...	...	1.00

SOURCE: **Katz and Summers** (1989 :225), using data from the United Nations, Department of International Economics and Social Affairs, *Industrial Statistics Yearbook, 1984*, vol.1: *General Industrial Statistics* (1986).

a. Year denotes yearly wages; hour denotes hourly wages. Wages are for operatives, except for France, where the wage is the average wage of all workers. The data cover 19 manufacturing industries. Data are available for only 18 industries for Korea and Australia, 17 for Germany, and 15 for France. Each pairwise correlation uses the maximum number of industries possible.

Most efficiency wage explanations are driven by the idea that firms have imperfect information about the profitability of individual employees.[11] In the case where employees are not perfectly informed about their own productivity, the critical condition then becomes that firms have less information than employees do about their own productivity. This can arise because workers have better knowledge of their own skills and abilities, as in adverse selection models, or because jobs allow workers considerable room for discretion in their performance, as in incentive models. The implicit assumption in all these cases is that *workers' performance cannot be perfectly and costlessly monitored by observing their output.* This is plausible given that piece rate systems can be costly to administer and that even where such payment systems exist, workers' contracts seldom specify the exact standards to which the output must be produced. In the presence of these informational problems, wages may serve as selection or incentive devices for increasing productivity, thus making it profitable for firms to pay workers more than the value of their next best opportunities (net of mobility costs). Wage differentials may then arise because these incentive and/or selection considerations are more important for some industries (or firms) than for others.

3.1 Selection Models of Efficiency Wages

In selection models of efficiency wages a firm may offer workers a wage premium if they are heterogenous in ability and have better information about their own abilities than do firms. If workers' abilities rise with their reservation wages, then higher wages will attract a more able pool of applicants and thereby increase the probability that the firm hires more able workers. Similarly, a firm facing an excess supply of labour may not lower its wage to the market-clearing level, because that would induce its best workers (i.e. those with the highest reservation wages) to quit. The crux of this variant of efficiency wage theory is that the wage at which a worker is willing to join the firm is a signal of the worker's (unobserved) ability.

The seminal paper by Weiss (1980) develops a model where workers with similar observable characteristics have different labour endowments and firms never learn about the productivity of their incumbents. Workers' reservation wages are assumed to rise with their labour endowments.[12] As a result, when a firm raises its wage offer, it attracts applicants with higher reservation wages and thereby increases the average productivity of its applicant pool. Since labour endowments are unobservable, firms hire randomly from their applicant pool. If the relationship between the wage and the expected productivity of new hires is strong enough, firms

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[11] The one notable exception to informational theories of efficiency wages is based on nutritional considerations. It has long been recognized that when workers' living standards are near subsistence level, increases in wages can lead to large increases in their productivity. Although this can generate a wage-productivity relationship similar to those of informational efficiency wages, it has limited application to industrial economies.

[12] Reservation wages are determined either by a worker's value of leisure (which rises with any available social assistance or unemployment benefits) or by the value of her output in the non-industrial or household sector, whichever is greater. The non-industrial sector is a term used to denote jobs where the problem of monitoring output does not arise. In such jobs, including self-employment, a worker's earnings are proportional to her output.

will choose a wage at which the queue of applicants exceeds the jobs available at the firm. This is the (non-market-clearing) wage at which the firm minimizes its costs per efficiency unit of labour hired. Workers' self-selection behaviour (based on private information about their alternative opportunities) allows firms to use wages as a sorting device in order to obtain more productive workers. It follows that wage differentials may arise if productivity in some industries or firms is more sensitive to unobserved ability than it is in others. In this case, high-wage labour may look like low-wage labour (in terms of observable characteristics), but it is on average more productive, with differences in productivity corresponding on average to differences in wages in equilibrium. Yet, workers in high-wage firms are more productive at the margin, because such firms hire workers up to the point where their marginal productivity is equal to the (high) wage.

One implication of this selection model is that the firm may not cut its wage in response to a drop in product demand, because this would incite its best workers to quit. It is optimal to respond instead with a policy of random layoffs. A second implication is that the model may be relevant even if firms do learn about the abilities of their incumbents, so long as they are unable to differentiate wages in line with ability (or to dismiss the low productivity workers) due to institutional, legal or social-psychological constraints (eg. morale effects).

3.2 Incentive Models of Efficiency Wages

Incentive models of efficiency wages are based on moral hazard problems, where workers control a private decision variable which affects the firm's profitability, but which the firm cannot costlessly monitor or directly control. Wage premiums may then be used to induce workers to behave in the firm's best interest. Premiums serve as an inducement, because workers know that the penalty for malfeasance (i.e. if dismissal occurs upon detection) is the loss of the present value of their premiums for the duration of their expected tenure. In this case, wage differentials may arise if the incentive considerations in question vary in importance across industries or firms (eg. some technologies require higher costs for monitoring worker effort or worker malfeasance may be more costly in terms of lost output in capital intensive industries).

The basic idea is that the profitability of labour depends on its own actions/decisions, and that firms can influence these actions through the wage. Wage premiums have the effect of increasing the worker's opportunity cost of acting against the firm's interest. In the context of the effort elicitation variant of incentive models, a worker earning her reservation wage is indifferent to whether or not she is caught shirking and dismissed (Shapiro and Stiglitz 1984). There is no penalty to being caught shirking, because the worker can find another job at the same wage. However, if it is costly for a firm to monitor effort[13], it could then save on its supervision costs by paying workers a wage premium and by promising to dismiss those who are caught shirking. The penalty of being dismissed, or the opportunity cost of shirking (accounting

[13] In general, the relevant condition is the difficulty or cost of writing contracts which specify all aspects of a worker's performance and the cost of enforcing workers' compliance to the contract by monitoring their performance.

for the probability of getting caught), is the present value of the wage premium over the worker's expected tenure. This premium minimizes the total labour costs of the firm and hence, is privately efficient. Yet, it is socially inefficient, because it creates job rationing in equilibrium. The firm has no incentive to hire workers up to the point where the value of the marginal product of labour (VMPL) is equal to the opportunity cost of labour.

In another incentive variant of efficiency wages - the labour turnover cost model - firms use wages to increase average labour productivity by influencing workers' quit behaviour. This arises because firms incur labour turnover costs, such as advertisement, screening, hiring, negotiation and training costs. Firms have imperfect information about the quit propensities of individual workers, although they know the quit function governing the behaviour of their incumbents as a whole. If quits are decreasing in the wage, the firm can offer its incumbents wage premiums (relative to their expected wages at other firms), thereby inducing them to lengthen their job tenure (Salop 1979, Iacobacci 1992). In this way, the firm economizes on its total labour costs by amortizing turnover costs over a longer expected job tenure.

In addition to shirking and labour turnover costs, firms incur other types of non-wage labour costs which can be reduced through wage premiums. For example, if labour productivity suffers when workers search on-the-job for alternative employment opportunities, it may be in the firm's interest to pay a wage premium in order to reduce the intensity of on-the-job search. In this case, the imperfect information that drives the efficiency wage problem is that firms cannot easily monitor their workers' on-the-job search efforts.

Yet another type of non-wage labour cost arises from recruitment considerations. If it is costly for a firm to have unfilled vacancies (eg. due to idle machinery), a wage premium may be used to increase the number of applicants per vacancy and to increase the probability that any given job offer is accepted (Lang 1991). Thus, firms with a high degree of capital intensity (or a high profitability per employee) could possibly increase their profitability by offering wage premiums.

3.2.1 Alternative devices for ensuring labour quality - the bonding critique

Most incentive models of efficiency wages are subject to the so-called bonding critique. The idea is that firms can devise more sophisticated employment contracts which extract all job rents from workers at the point of hiring without distorting their future incentives to provide effort, to stay in the job, or to behave in the firm's interest in other ways. Workers who are unemployed or in low-paying jobs will compete for the rent-paying jobs and hence, will be prepared to pre-commit themselves to acting in the firm's interest by paying a job entrance fee or by posting a bond which would be forfeited upon detection of malfeasance.[14] However, few such Pareto-optimal contracts are observed in practice. This bonding critique is examined at length in

[14] The recruitment model is immune to this critique, because it is based on coordination problems in matching workers to jobs. Hence, this is not a model where an additional wage instrument, such as an entrance fee, can solve the non-market-clearing problem.

Iacobacci (1992a), where it is argued that institutional constraints which are endogenous to the imperfect information problems in labour contracts may prevent firms from devising Pareto-optimal contracts.

3.3 Fairness Models of Efficiency Wages

In contrast to selection and incentive models, norm-based (or fairness) models of efficiency wages are not restricted to the assumption of individualistic utility maximization. The determinants of workers' behaviour are expanded to include their morale or feelings of loyalty to the firm, which are influenced in turn by whether the firm is perceived to be paying a fair wage. These norm-based models differ somewhat in the rationales provided for wage stickiness, but they share the feature that a worker's behaviour depends not only on her own wage, but also on that of other workers in her reference group. As in other efficiency wage models, the result is that the job market may not clear in equilibrium when the wage serves to allocate labour as well as to satisfy the social conventions and the interpersonal and intertemporal norms required for worker performance (Akerlof 1980, Solow 1979). In addition, these norm-based models can provide rationales for stylized facts left unexplained by the standard efficiency wage models (eg. the practice of not firing less productive workers, and setting work standards that are exceeded by most workers). Fairness considerations also suggest that product market factors and firms' "ability-to-pay" may have a direct impact on wages, thereby explaining the positive correlation between profits and wages across industries. Finally, these models are not subject to the bonding critique discussed above.

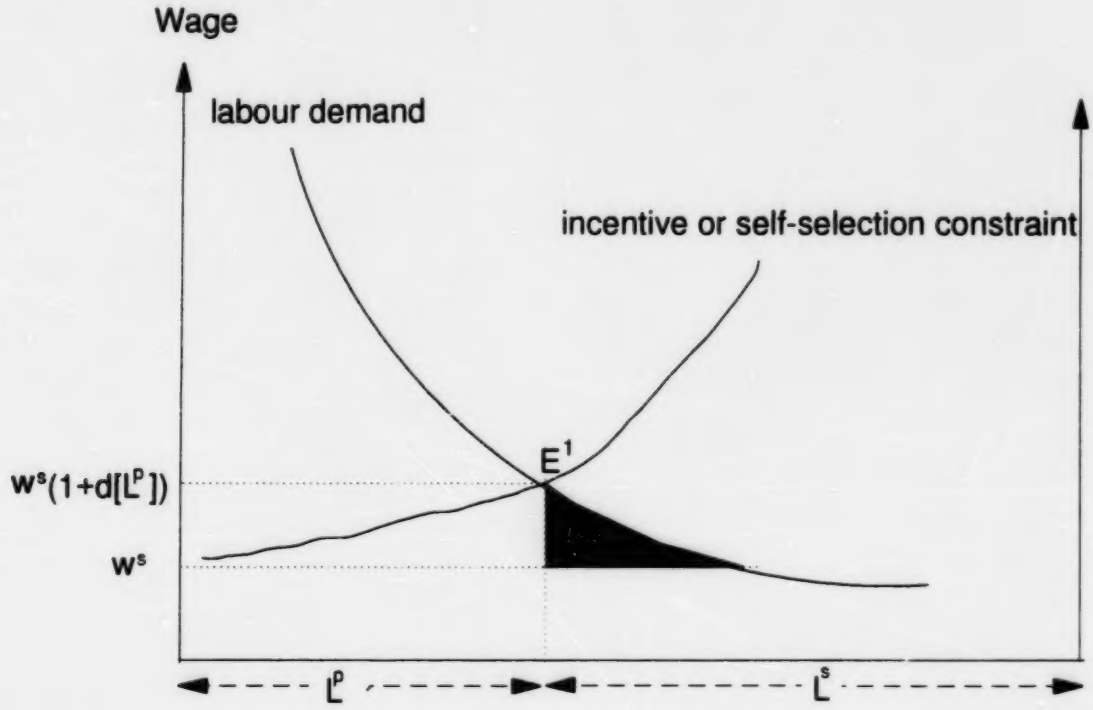
3.4 Labour Market Distortions Arising From Efficiency Wages

If interindustry wage differentials are due to efficiency wage considerations, the resulting labour market distortions are allocative in nature. When the efficiency wage sector pays a wage premium, its employment level will be suboptimal in equilibrium. This is because efficiency wage firms stop hiring workers when the value of their marginal product (VMPL) still exceeds that in the secondary (i.e. non-efficiency-wage) sector.

Following the Katz and Summers (1989) model of a stylized economy, assume that there exists a primary sector, where firms have imperfect information about the productivity of individual workers due to incentive or selection considerations, and a secondary sector in which firms observe workers' output costlessly. The product markets for both primary and secondary sector firms are competitive, and we take the case of a closed economy with a fixed capital stock.

Primary and secondary sector firms face a supply of labour (in hours) which is perfectly elastic at w^r - the reservation wage. However, in the primary sector, workers' willingness to take jobs does not in itself ensure that they have the desired ability, or that they will provide the desired effort and generally act in the firm's interest. As explained earlier, a wage premium is required to hire workers with the desired ability or to give workers the incentive to behave in the firm's

Figure 5
ALLOCATIVE DISTORTION IN THE PRESENCE OF EFFICIENCY WAGES



best interest.[15] These self-selection and incentive constraints are represented in Figure 5 by the upward-sloping curve, which represents the effective labour supply (in efficiency units). The upward slope of the curve implies that the premium depends positively on the employment level in the primary sector (L^P). In terms of the incentive version of efficiency wages, the intuition is that the greater the relative importance of the primary sector in the labour market, the lower the cost to the worker of being dismissed from a primary sector firm, given the higher probability of being rehired by another primary sector firm. Hence, each primary sector firm must pay a

[15] For a wage premium to be optimal, there must be a range of wages where productivity rises more than proportionately with the wage.

larger wage premium to maintain the correct incentives for its workforce.[16] The wage premium at which profits are maximized, $d[L^p]$, can be derived explicitly in models where the wage-productivity relation is endogenous (eg. Shapiro and Stiglitz 1984, Bulow and Summers 1986).

Secondary sector output, taken as the numeraire, is given by $Y^s = w^s L^s$, where w^s is the marginal product of workers in the secondary sector and L^s is the level of secondary sector employment. Primary sector output is given by the constant-returns-to-scale production function[17]

$$Y^p = F[K^p, L^p].$$

The demand for primary sector output is a decreasing function of its price, $p = p[Y^p]$, $p' < 0$. Once primary firms have chosen their efficiency wage, they make their employment decisions based on their labour demand curve. Given the aggregate profit function of primary sector firms, one obtains the first-order condition determining the level of primary sector employment,

$$p[Y^p]F_L[K^p, L^p] = w^s(1 + d[L^p]).$$

Primary firms hire workers up to the point where their VMPL is equal to the secondary sector wage plus the wage premium, as shown in Figure 5 (point E^1). The result is that labour is allocated inefficiently between the primary and secondary sectors: the VMPL in the primary sector exceeds that of the secondary sector by the magnitude of the wage premium. The efficiency loss from this market-induced distortion is represented by the shaded triangle.

The results of this analysis of wage differentials based on efficiency wage rationales do not differ qualitatively from one where the wage differentials are exogenous. This is because employment is determined competitively in both cases. The distortion takes the form of underemployment in the primary sector. That is, any worker in the secondary sector would be more productive if employed in the primary sector. Such workers are willing to take primary sector jobs, even if primary sector firms lowered their wage (provided it is not lower than w^s). Yet, primary firms have no interest in hiring more workers, be it at the going primary sector wage or at w^s. Efficiency wage theories explain why this market failure arises, and how the magnitude of this failure can vary with the size of the efficiency wage sector.

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[16] The upward-sloping effective labour supply curve can also be understood in terms of the externalities created by each firm which pays a wage premium. Although a wage premium may be privately optimal for the relevant firm, it increases the alternative opportunities of workers from other firms and thereby compels such firms to pay higher wage premiums to give their own workers the same incentive to hold onto their jobs. The more firms pay wage premiums, the higher the premium each must pay to maintain the same incentives for its workers. In the selection version, a wage premium offered by one firm raises the reservation wage of workers in other firms. This externality means that all other efficiency wage firms must pay higher premiums to ensure that they continue to attract workers with the same average ability as in the absence of the externality.

[17] The assumptions of a closed economy, a fixed capital stock, and a secondary sector which does not require capital inputs can all be relaxed without altering the qualitative results.

4. WORKER BARGAINING POWER AS A RATIONALE FOR WAGE DIFFERENCES

Interindustry wage differentials may also arise due to union bargaining power, or workers' market power more generally. The purpose of this section is to determine whether or not the marginal labour productivity (VMPL) distortions in this case are qualitatively similar to those where interindustry wage differentials are due to efficiency wages. To examine this issue, we start with the two types of models found in the literature on trade union theory: the monopoly union model and the efficient bargains model, as expounded in Oswald (1985), Malcomson (1987) and others.

The main characteristic of trade union models of wage determination is that workers bargain collectively. That is, the union bargains as a single entity, representing all its members. The union is assumed to have some degree of market power in determining its wage and possibly even the employment level for its members.

4.1 The Monopoly Union Model

In the monopoly union model, the union is assumed to have the power to control the supply of labour to one or more firms at least up to the level applicable in a perfectly competitive market (n^c in Figure 6 below). In other words, the union has the power to prevent the firm(s) from bypassing a high wage by hiring nonunion workers from the secondary labour market. This may be relevant when the union runs a closed shop such that it controls either entry into an occupation, or the wage rate.

The monopoly union maximizes its objective function by setting the wage rate unilaterally, subject to knowledge that the relevant firm(s) will respond with a level of employment where the VMPL is equal to the union wage. In other words, the union sets the wage unilaterally and the firm (or industry) responds by setting employment unilaterally along its labour demand curve. Given that union employment is determined competitively, the resulting distortion in the VMPL between the union (or primary) sector and the competitive secondary sector is qualitatively similar to the efficiency wage case.

This monopoly union model is set up as follows. Assuming the union is utilitarian in that it is concerned with the sum of utilities of all its members, it will maximize[18]

$$U = n[w,p]u[w] + \{m - n[w,p]\}u[w^s], \qquad (1)$$

where w^s = reservation wage (or level of unemployment benefit),
m = union membership (exogenously given),
$n[.]$ = demand for labour,
p = price of output (exogenously given),

[18] An objective function of the expected utility form does not alter the results, provided union membership is assumed fixed (Oswald 1985).

$u[.]$ = concave utility function of individual worker, and
w = union wage.

This union utility function is represented by the indifference curve mapping in Figure 6. The slope of an indifference curve represents the union's willingness to trade off wages against the employment of its members, holding utility constant. Hence, the strictly convex indifference curves imply that the union cares about the level of employment level among its members - in the sense of providing a wage above w^s to more of its members - and is thus willing to trade off a lower wage for higher employment. Higher union utility levels are attained as the curves shift outward from the origin. Moreover, the indifference curves are asymptotic to the horizontal line w^s, because the union maximizes its rents rather than its wage bill. The idea is that any union member can get their reservation wage, which is determined either in the competitive secondary labour market or by the level of unemployment benefits.[19] It is not worth sacrificing high wages for extra union jobs that pay less than the competitive market wage.

The firm's (or industry's) profits are given by

$$R = pf[n] - wn, \tag{2}$$

where $f[.]$ is a concave production function with one input only. The firm takes the (union) wage as given and maximizes its revenue with respect to the level of employment. The resulting labour demand schedule shows the level of employment in the union sector where the VMPL equals the wage, for any given wage.

The union's desired wage (w^u) is given by the first derivative of (1) with respect to the wage, evaluated at the point where the marginal benefit from a wage increment is equal to the cost:

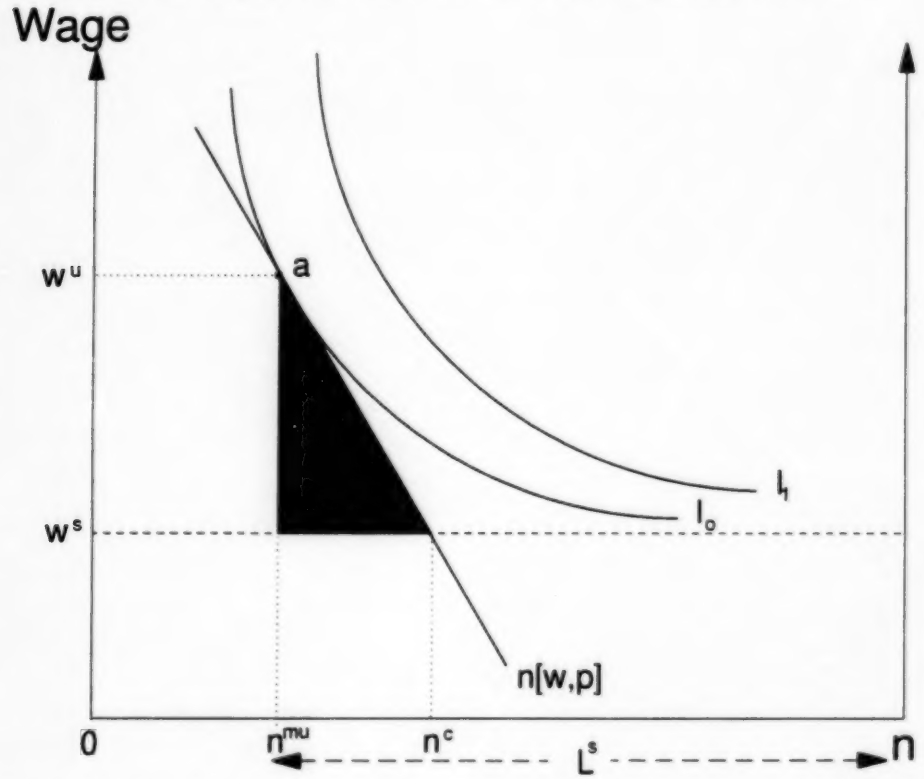
$$U_w = u'[w]n[w,p] + n_w[w,p]\{u[w] - u[w^s]\} = 0. \tag{3}$$

The marginal benefit from a wage increment is given by the first term of the equation: the marginal utility from a higher wage multiplied by the number of employed members. The marginal cost is given by the number of members who lose their jobs multiplied by the utility lost by each such member - the second term of the above equation. In terms of Figure 6, the union's choice of a wage is given by the tangency of the union indifference curve to the labour demand curve (point a).

The crucial feature of this model is that the union wage exceeds the competitive wage (w^s). Given that employment in the union sector is determined along the labour demand curve, the employment level in that sector will be lower than in competitive equilibrium ($n^{mu} < n^c$). This means that the VMPL in the union sector will exceed that in the secondary sector where

[19] For simplicity, the union (or primary) sector of the labour market is assumed to be sufficiently small that it does not affect the competitive wage. A large union sector with job rationing could depress the competitive wage in the secondary sector.

Figure 6
ALLOCATIVE DISTORTION IN THE PRESENCE OF A MONOPOLY UNION



$pf'[n] = w^s$. Therefore, the allocative distortion here is qualitatively similar to that in efficiency wage models (or that in models where sectoral wage differentials are exogenous). There is underemployment in the sector of the economy where workers earn job rents. The efficiency loss resulting from this distortion is given by the shaded triangle.

3.2 The Efficient Bargains Model

A major criticism of the above analysis is that the wage-employment outcome (w^u, n^{mu}) on the labour demand curve is not efficient, given that the union cares about how many of its members have access to job rents.[20] This is shown by plotting the firm's (or industry) iso-profit curves which underlie the labour demand curve, as in Figure 7. The outcome at point *a* is inefficient, because the firm can increase its profits (from the level represented by the iso-profit curve R_0) and the union can increase its utility (from the level I_0) by choosing any wage-employment outcome in the area below the R_0 curve and above the I_0 curve. The basic idea is that the union prefers to trade off a lower wage for a higher employment level among its members and in so

[20] This idea is due to Leontief (1946) and popularized by McDonald and Solow (1981).

doing it also allows the firm attain higher profits. The efficient bargains model allows the union and the firm to exploit these "gains from trade" by assuming that the two parties can conclude an enforceable contract over both wages and employment. This means that employment is no longer determined competitively in this model. As a result, the distortion of the VMPL across sectors may differ qualitatively from that in models where employment is set along the labour demand curve.

Following Oswald (1985), take eqn. (1) as the union's objective function and eqn. (2) as the firm's profit function. Efficiency dictates the maximization of one function subject to an arbitrary value of the other, giving a set of efficient outcomes represented by a contract curve:

$$\frac{u[w] - u[w^s]}{u'[w]} = w - pf'[n]. \qquad (4)$$

It is easily verified that the contract curve is upward-sloping in wage-employment space ($\partial w^{eb}/\partial n > 0$, where w^{eb} is the equilibrium union wage along the contract curve). The critical feature of this model is that equilibrium employment in the union sector is greater (and the VMPL lower) than it would be in the absence of the union. This is verified by adding $u'[w]w^s$ to both sides of (4), and re-arranging to obtain

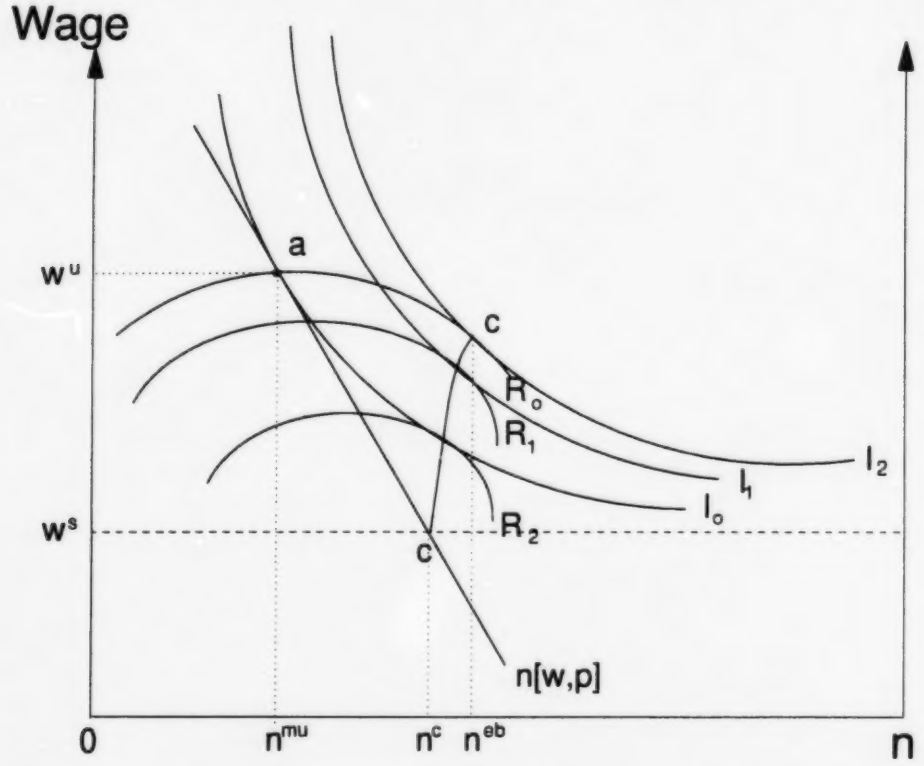
$$u[w] - u[w^s] + u'[w](w^s - w) = u'[w](w^s - pf'[n]).$$

The l.h.s. is positive by virtue of the concavity of $u[.]$, thus implying that $pf'[n]$ is less than or equal to the reservation wage. This means that the VMPL in the union sector tends to be less than that in the competitive secondary sector. In this case, the inefficient allocation of labour across sectors is qualitatively different from that in the monopoly union and efficiency wage cases, because there is over- and not under-employment in the sector with job rents.

This result is represented graphically in Figure 7. Each iso-profit curve represents wage-employment combinations that generate the same level of profits. These profits increase as the firm attains iso-profit curves closer to the employment axis along the labour demand curve. The slope of the iso-profit curve illustrates the firm's ability to substitute between wages and employment while holding profits constant. If the union does not care about the level of employment among its members (i.e. union indifference curves are flat), the firm will choose the employment level at which it reaches the lowest iso-profit curve, for any given wage. These optimal employment levels generate the labour demand curve.

However, if the union indifference curves are downward-sloping, the firm is not required to take any wage on the labour demand curve as given. The firm can "buy" a wage reduction from the union at the "price" of additional employment for union members, because the union is willing

Figure 7
ALLOCATIVE DISTORTIONS UNDER THE EFFICIENT BARGAINS MODEL



to trade off wages and employment.[21] Hence, if the union and the firm can bargain over wages and employment and the resulting contracts are enforceable, they both have an interest in choosing wage-employment combinations to the right of the labour demand curve. In this sense, the wage-employment combinations generated by the monopoly union model are Pareto-inefficient, because at least one party can be made better off without making the other party worse off. The efficient combinations are the points of tangency between the firm's iso-profit curves and the union's indifference curves, which form the contract curve. As compared to point *a*, the point of tangency between the I_2 and R_0 curves would make the union much better off and leave the firm's profits unchanged, while the point of tangency between the I_0 and R_2 curves would leave the union indifferent but increase profits substantially. Any point between these two extremes on the contract curve would leave both parties better off relative to point *a*. The actual point chosen on the contract curve depends on the relative bargaining strength of the two parties. The weaker the union, the closer the outcome will be to the perfectly competitive one where the contract curve meets the labour demand curve - i.e. the point of maximum profits subject to a sufficient supply of workers.

[21] The return to the union from a lower wage may not be just a greater number of members employed in the union sector, but also greater job security for the currently employed members.

To reiterate, this model suggests that the distortion in the sectoral allocation of labour arising from union-induced wage differentials differs qualitatively from one due to efficiency wages. The positive slope of contract curve implies that equilibrium employment in the union sector exceeds the competitive level ($n^{eb} > n^c$), whereas the opposite is the case in a primary sector due to efficiency wages.

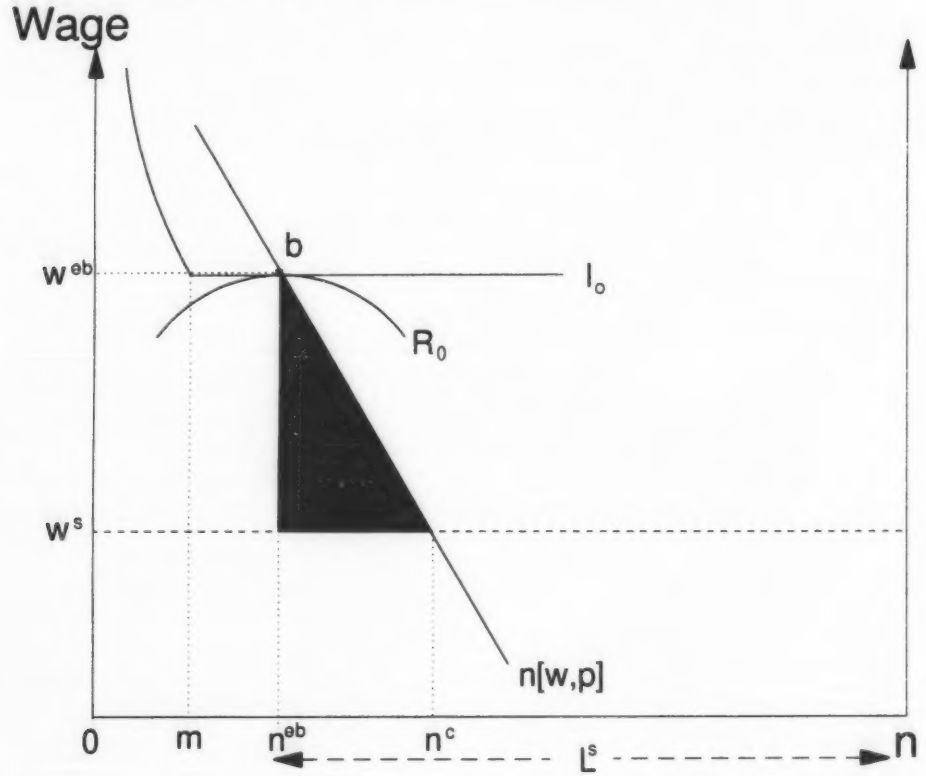
4.2.1 Do efficient bargains necessarily imply over-employment in the primary sector?

Given that the nature of the allocative distortion - be it primary sector over-employment or under-employment - depends critically on the slope of the contract curve, it is necessary to determine whether or not this slope is sensitive to changes in the union's objective function. The union's objectives are reflected in the assumptions made about its utility functions and its membership - the latter having been taken as exogenous up to this point in the analysis. First, consider the case where union members are treated equally by the union - i.e. all having the same weight in the union's objective function. In this case, so long as union membership exceeds the competitive employment level (n^c) and the union's objective function is based on standard utility functions of individual members (either of the expected utility or utilitarian forms), the contract curve will be positively sloped and the excess employment result will hold. On the other hand, if union membership is less than or equal to the competitive employment level, union indifference curves become perfectly horizontal at the point where employment is equal to union membership. This is because the union has no interest in taking a wage cut to increase the employment prospects of non-members - their welfare does not enter the union's objective function. As a result, the contract curve may be vertical or even negatively sloped, implying that equilibrium employment in the union sector may be less than the competitive level. The allocative distortion arising from such a union-induced interindustry wage differential is qualitatively similar to that under an efficiency-wage-induced differential.

Oswald (1985) provides an example of this case, where union membership is less than equilibrium employment in the union sector, which in turn is less than the competitive employment level ($m < n^u < n^c$). As shown in Figure 8, the flat segment of the union indifference curve starts at point m, where employment is equal to union membership. Since union employment exceeds membership - a possibility when the union sector is expanding - the tangency with the iso-profit curve occurs on the flat segment, and hence, on the labour demand curve. In other words, the contract curve lies on the labour demand curve. It follows that the allocative distortion is similar to that in the monopoly union model. The union sector is subject to an under-employment distortion. The efficiency loss is represented by the shaded area.

The problem here is that the efficient bargain does not appear to be a stable or stationary equilibrium, because the union controls only a fraction of the labour supply to the firm ($0m/0n^c$). There is nothing in the model which prevents the firm from hiring non-union members at the reservation wage and thereby moving to the competitive employment level and eliminating the allocative distortion in question. For point b to be a stable equilibrium, the firm must face

Figure 8
EFFICIENT BARGAINS ON THE LABOUR DEMAND CURVE



additional costs (i.e. in excess of the reservation wage) to replacing union employees with non-union members. These labour turnover costs, including hiring, training and dismissal costs, are an important source of workers' bargaining power, as explained below in the section on insider-outsider theories.

The second case to consider regarding how allocative distortions depend union objectives is one where the union places greater weight on the preferences of some of its members over those of others. This usually takes the form of "last in, first out" or other seniority rules for layoffs. In such scenarios, union bargaining strategies can be determined by a majority of union members who are indifferent to the employment level, because seniority shelters them from layoffs at the margin. The result is that the contract curve may take on a negative slope. The underlying idea is that the greater the union's bargaining power, the higher the wage it can negotiate in exchange for lower employment, to the detriment of its junior members. The allocative distortion from such a union-induced wage differential is qualitatively similar to one where employment

decisions are made on the labour demand curve, because in both cases there is under-employment in the sector with job rents.[22]

4.2.2 Criticisms of efficient bargains models and implications for allocative distortions

There are reasons other than the nature of union indifference curves which explain why union-induced interindustry wage differentials may give rise to allocative distortions qualitatively similar to those in efficiency wage cases. These reasons have to do with the relevance of efficient bargains models, given the difficulty of enforcing union-firm contracts over employment.

The most important criticism of efficient bargains models is that they appear inconsistent with the casual observation that firms tend to make their employment decisions unilaterally - rather than in conjunction with unions. Explicit union-firm agreements on employment levels are seldom observed. This does not rule out the possibility of implicit agreements over employment. However, the problem is one of contract enforceability. Once the union agrees to a wage - and the agreement is enforceable - the firm has an incentive to choose its employment level by equating the VMPL to the union wage, because it can thereby increase its profits. In other words, once the firm has secured the wage concession, it has an interest in reneging on its agreement over employment. In Figure 7 one can see how the firm can attain a lower iso-profit curve by moving horizontally to the labour demand curve from any point on the contract curve. This scenario is most likely to occur if the agreement on employment is an implicit one that the union cannot easily enforce. Yet, implicit employment agreements may still be enforceable through contractually explicit restrictive employment practices which set the number of workers required for any particular task. Nevertheless, the point is that if the union expects firms to renege on their employment promises, it will not agree to the wage concession in the first place. The result is that the firm's employment decision will be made on the basis of its labour demand curve. Hence, this contract enforcement problem has the effect of discounting the over-employment result of efficient bargains models. The implication is that the allocative distortions from union-induced interindustry wage differentials may not differ qualitatively from those in the efficiency wage case - i.e. under-employment in the job rents sector.

4.3 Insider-Outsider Theories of Workers' Market Power

Monopoly union and efficient bargains models can generate interindustry wage differentials on the assumption that workers have bargaining power and that the degree of bargaining power differs across industries. Insider-outsider theories explain the potential sources of workers' market power. These theories suggest that job incumbents derive both individual and collective bargaining power from situations where firms find it costly to replace them with workers from

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[22] See Gunderson and Riddell (1988) for a formal derivation of a contract curve which may be positively or negatively sloped. They differ from much of the union bargaining literature by assuming an aggregate union utility function rather than a union objective function derived from the utility functions of individual members.

the external labour market. An important implication is that workers may have the market power to extract job rents even in non-unionized firms.

Insiders is the term used for experienced incumbents whose jobs are protected by various measures that make it costly for firms to fire them and hire other comparable workers in their place. They can participate in wage negotiations, influence the work morale and productivity of colleagues, cooperate with management in increasing productivity or engage in strikes, work-to-rule activities and other actions costly to the firm. Outsiders are not protected by any turnover costs, nor can they engage in strategic activities which increase their attractiveness to firms - for a given wage. "Entrants" are a third category of recently hired workers who expect eventually to gain insider status, but firms can replace them without incurring significant turnover costs.

The basis for individual and collective bargaining power in insider-outsider models rests with the various turnover costs that firms expect to incur in replacing incumbents. These costs enable job holders to extract rents from the firm, because they can increase wages well above the reservation level before it becomes profitable for the firm to replace them. Different types of turnover costs provide insiders with different devices for exerting pressure on wages. Lindbeck and Snower (1986, 1987a) and Solow (1985) explore the effects of hiring, training and firing costs, where the latter may include severance pay, and costs of negotiation, litigation, and implementation of legally mandated firing procedures. According to Lindbeck and Snower (1986:107-08), when insiders bargain individually with firms, they maximize their wage (or job rents) subject to two constraints: (i) that the wage does not exceed the insider's marginal product plus the marginal firing costs, otherwise the firm would fire the insider, and (ii) that the wage lies below the level at which the firm can profitably replace the insider with an outsider. The latter constraint does not bind so long as the difference between insiders' and entrants' wages is less than the marginal hiring and firing costs.

It follows that the greater the hiring and firing costs, the greater the bargaining power of incumbents and the higher the wage (and rents) they can extract from the firm. To the extent that these turnover costs differ across industries, there will be noncompetitive interindustry wage differentials.

Insider-outsider models based on such turnover costs are subject to the same bonding critique as the incentive-type efficiency wage models examined in section 3. If firms expect newly hired workers to subsequently extract rents by renegotiating their wages as insiders, it is optimal to charge an entrance fee or to lower the starting wage up to the point where applicants' expected utility from the job falls to the level of their reservation utility.

The bonding critique is not as effective against insider-outsider models based on other types of turnover costs, such as when insiders refuse to cooperate with entrants and directly harass them. Lindbeck and Snower (1988a) recognize that the productivity of incumbents and their disutility of work is interdependent. Insiders may thus extract job rents by threatening to withdraw their cooperation from entrants and refusing to train them, and by threatening to harass or damage their personal relations with them. These discretionary types of turnover costs undermine the ability

of outsiders to underbid insiders for their jobs, partly because noncooperation reduces entrants' productivity, making them less valuable to the firm, and partly because the threatened harassment reduces entrants' expected utility from the jobs. Hence, outsiders may be either unable and/or unwilling to replace insiders, even though the two groups have identical productivity traits.

In the context of this paper, insider-outsider theories provide rationales for why efficient bargain outcomes may be stable equilibria even when the union's membership is less than the competitive employment level (as in Figure 8) - i.e. even when the union cannot directly control the supply of labour to the relevant firms. In the trade union models discussed earlier, the control of labour supply to firms is the device used to assume that unions have market power. Insider-outsider theories show that the control of labour supply is not a necessary condition for exercising market power. Workers in the external or secondary labour market are unable to underbid job incumbents in the primary sector, because firms incur various turnover costs in replacing insiders with outsiders - and not because underbidding is ruled out through arbitrary assumptions.

5. CONCLUSION

Our review of the empirical literature suggests that there exist large and persistent interindustry wage differentials in Canada as well as in the U.S.. These are the wage differentials which remain unexplained after controlling for differences in workers' human capital and demographic characteristics and for differences in job characteristics across industries. The tentative implication is that workers in high-wage industries tend to earn rents (i.e. wages in excess of opportunity costs), while similar workers with similar skills earn reservation wages in low-wage industries. The only remaining hypothesis for reconciling the estimated wage differentials with competitive wage determination is the possibility of unmeasured differences in labour quality across industries. The several methods used to evaluate the significance of this hypothesis indicate that it still leaves much of the estimated interindustry wage differentials unexplained. Therefore, it would seem that the estimated interindustry wage differentials cannot be explained by the idea that workers in high-wage industries are on average better workers. Instead, these differentials likely reflect the presence of significant rents in the labour market.

This raises the fundamental question of whether or not the industries that pay job rents also have a higher marginal labour productivity and hence, an under-employment distortion. This issue was addressed by considering the various explanations for noncompetitive interindustry wage differentials and the manner in which employment decisions are made under each paradigm. Each explanation suggests that there are industries with good jobs and those with bad jobs, in the sense that workers prefer industries which offer better job rewards for given qualifications and working conditions. The resulting distortions in the economy can be of two types: the sector with job rents - i.e. the primary sector - is subject either to under-employment or over-employment.

When interindustry wage differentials are due to efficiency wage considerations, firms knowingly pay workers more than their opportunity costs in order to give them the incentive to hold on to their jobs and thereby behave in firms' interests, and/or to attract more able workers to their applicant pool and thereby increase the probability of hiring better workers. In both these incentive and selection cases, firms make their employment decisions by equating the value of the marginal productivity of labour (VMPL) to the efficiency wage. Hence, the VMPL in the primary sector will be higher than in the secondary sector, where no wage premiums are paid, thereby implying under-employment in the efficiency wage sector. It follows that production decisions are also distorted, because under-employment means that the primary (or efficiency wage) sector is producing less than under first-best efficiency, where the VMPL is equal across sectors.

If interindustry wage differentials are due to workers' bargaining power, the distortion may take the opposite form to that in the efficiency wage case - i.e. primary sector over-employment. This may occur if unions are interested in increasing primary sector employment and if each union and firm can reach an enforceable agreement over wages and employment. It can then make sense for the union and the primary firm to trade off a lower wage for higher employment, possibly leading to primary sector over-employment. This union-firm contract - known as an "efficient bargain" - means that the primary sector firm "buys" a wage reduction from the union at the "price" of higher employment for union members. Primary sector workers continue to enjoy rents, but the rents per worker are less than if the union had not bargained for higher employment.

However, the presence of union power need not necessarily lead to primary sector over-employment. If the union does not care about providing more primary sector jobs, or if union-firm bargains over employment are not enforceable, the distortion may be similar to the efficiency wage case - i.e. primary sector under-employment. For example, if the firm's commitment to additional employment cannot be enforced, the firm has the incentive to renege on its employment promise after securing the wage concession from the union. Knowing this, the union has no incentive to agree to the wage concession in the first place. Therefore, explanations of wage differentials based on workers' bargaining power may be consistent with under-employment in the primary sector, particulary in the absence of explicit agreements over employment or restrictive work practices which serve as implicit employment agreements.

In summary, the essential argument is that there are many microeconomic rationales for the persistence of noncompetitive wage differentials across industries and that these differentials are a form of market failure.[23] Wage premiums are often the outcome of firm decisions which are privately optimal, but socially sub-optimal. The wedge between private and social benefits arises because marginal labour productivity is higher in firms with wage premiums, and yet these firms have no incentive to hire additional workers in the absence of any policy intervention.

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[23] The exception is when wage differentials are due to bargaining power derived from statutory provisions, such as mandatory severance pay or anti-scab legislation. These are instances of policy rather than market failures.

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